

# PATENT SPECIFICATION

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- (21) Application No. 24409/72 (22) Filed 24 May 1972  
 (61) Patent of Addition to No. 1342880 Dated 19 Apr. 1971  
 (23) Complete Specification filed 24 May 1973  
 (44) Complete Specification published 29 Oct. 1975  
 (51) INT. CL<sup>2</sup> B29C 1/16  
 (52) Index at acceptance B5A 1F2X  
 1R6E 2A1 2E6  
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## (54) IMPROVEMENTS IN OR RELATING TO PASTRY OR LIKE BAKING

(71) We, J. LYONS & COMPANY LIMITED, a British company of Cadby Hall, London W14 0PA, do hereby declare 5  
 the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention comprises an improvement 10 in or modification of the invention described and claimed in Patent No. 1,342,880, hereinafter referred to as the main patent.

The main patent describes and claims a method of baking food products which includes subjecting mating metallic dies, together forming a mould determining the form of a baked product, to a cycle of operations which includes the steps of separating the dies and removing a baked food product from the mould, juxtaposing the dies, introducing uncooked foodstuff into the mould and producing electric currents in the dies to heat the dies.

The present invention adds to this method 25 the additional step of clamping the mating dies together immediately upon juxtaposition and until just prior to die separation.

The main application further described 30 and claims apparatus for baking food products including a plurality of sets of dies, a set of dies forming when juxtaposed, a mould of predetermined form, means at one position for separating juxtaposed sets of dies, means at another position for juxtaposing a set of dies to form a mould, means at a further position for producing electric currents in said dies thereby to heat said dies, and means for transporting said dies in closed paths between said positions and said current inducing means.

The present invention adds to such apparatus the feature that each set of dies includes reversibly operable means for

clamping the dies of a set together and that means are provided for clamping said dies after they have been juxtaposed and for releasing the clamping means prior to the separation of the dies.

Preferred features and advantages of the invention will become apparent from the following description taken in conjunction with the accompanying drawings, comprising Figures 1—10, of which: —

Figures 1 and 2 show respectively a plan view and a side elevation of a pair of dies arranged for use in accordance with the invention;

Figures 3 and 4 are respectively a scrap elevation, partly sectional, and a scrap plan of a locking device used on the die pair of Figures 1 and 2;

Figure 5 shows a general view of an actuator assembly for operating the locking device of Figures 1—4;

Figures 6 and 7 show respectively a plan view and an elevation of the actuator mechanism used in the assembly of Figure 5.

Figure 8 shows a movable stop mechanism used in conjunction with the assembly of Figure 5;

Figure 9 shows one device used for positioning a locking device prior to the placing of an upper die upon a lower, and

Figure 10 shows another locking device positioning arrangement.

Figures 1 and 2 show a die set 10 consisting in this embodiment of an upper die 11 and a lower die 12. Each die comprises similar parts of two baking moulds 13a, 13b, used in the baking of foodstuffs as described in the main patent. Alignment of the two dies of the pair is ensured by locating pins projecting from the upper surface of the lower die and entering appropriately positioned holes in the lower surface of the upper die as this is placed upon the lower. In ac-

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cordance with the present invention the dies of the set are held together by clamping means 14 which prevent separation of the dies as a result of vapour or steam pressures arising in the moulds during heating of the foodstuff in the baking process. Conveniently the clamping means 14 includes a clamping member mounted upon one die for movement between a first position in which it engages a second die juxtaposed with said first die to clamp the dies together and a second position in which the dies are free to be separated. Automatic securing and releasing means are provided to lock and unlock the clamping means at appropriate stages in the operating cycle.

The preferred embodiment of clamping means shown in Figures 3 and 4 comprises a clamping member of non-circular form passing through an aperture in the second die and arranged for rotation about an axis lying parallel to the direction of separation of the dies between a position in which the non-circular portion clampingly engages the second die and a position in which this portion may pass freely through the aperture as the dies are juxtaposed or separated. In the illustrated embodiment there is shown a pin 15 rising from the upper surface of the lower die and provided with a rotatable T-head 16 of generally rectangular form. The head 16 of pin 15 passes through an appropriately shaped slot 17 which is formed in a portion 11a of upper die 11 and is surrounded by a planar surface 18. Head 16 is mounted on the pin 15 so that the surface nearest the die is spaced from the die by a distance substantially equal to the thickness  $d$  of the portion 11a of upper die 11 containing the aperture 17 through which head 16 passes. To lock the dies together, head 16 is rotated through 90°, to the position shown in broken line in Figure 4. As shown in Figure 3, pin 15 may comprise a bolt screwed into lower die 12 and passing through a head member 16, which is recessed at 15a to receive the bolt head. A plate 19 held to head 16 by countersunk screws 19a covers the recess. A light spring 20 urges head member 16 against the head of the bolt 15 and largely prevents unwanted rotation of the locking head 16 during periods in which the dies are separated.

Figure 5 shows the general arrangement of an assembly for automatically actuating the locking devices 14 of a die pair 10 carried on a roller conveyor 21. The die pair is moved by suitable means (not shown) in the direction of arrow 22 until arrested by removable stops 23 placed on either side of the conveyor and further described below in relation to Figure 8. When arrested by stops 23, the die pair 10 presents its locking devices 14 exactly beneath a pair of forked actuating members 24 carried on a vertically movable

actuator assembly 25 and arranged for coupled rotation about an axis aligned with the pins on which the locking devices are mounted. The mechanism by which actuating members 24 are rotated is omitted from this Figure for the sake of clarity in illustration. The mechanism may be chosen as desired but a convenient arrangement is described below in relation to Figures 6 and 7.

Assembly 25 is guided for vertical movement with constant alignment by suitable guide means (not shown) and is provided with appropriate means to raise and lower it at the correct times in relation to the intermittent movement of the die pairs. Figure 5 shows a pneumatic actuator 26 of which the cylinder is secured to a member 27 of the machine frame and the piston rod is secured to assembly 25. The assembly is provided with a pressure pad 28 which, when the actuator 26 is operated to lower the assembly, presses on the upper surface of upper die 11 of a die pair 10 so as to hold down the die and to allow actuating members 24 to engage the respective locking devices 14 of the die pair 10.

When the die pair has been arrested beneath the actuator assembly, actuator 26 is operated to lower the assembly and the forked actuating members 24 engage the clamping devices 14. The actuating members are then turned through 90°, thus reversing the condition of the two clamping devices (locking them if they were previously unlocked, and vice versa). The assembly 25 is then raised by actuator 26, stops 23 are lowered and the conveyor advancing mechanism may move the die pair onward.

Figures 6 and 7 show the construction of an embodiment of movable actuator assembly 25. In the side view of Figure 7 the assembly is shown lowered upon a die pair 10 so that the actuating members 24 of the assembly engage the clamping devices 14. In the plan view of Figure 6 the die pair is omitted for the sake of clarity in illustration. The assembly is moved vertically by the piston rod 26a of actuator 26 (figure 5), which is secured to a support member or beam 30 through which pass spindles 31 carrying the forked actuating members 24 at their lower ends and provided at their upper ends with actuating levers 32, 33, of which the former has a single arm and the latter two opposed arms. A coupling rod 34 couples the two actuating levers for simultaneous rotation of the actuating members 24 through 90° under the control of a pneumatic actuator 35, of which the cylinder 35a is pivotally mounted upon beam 30 and the piston rod 35b is coupled to one arm of lever 33. When piston rod 35b is extended the lever arms to which it is coupled move to the positions shown in broken line in Figure 6, thus rotating both actuating mem-

bers 24 through 90' to lock or to unlock the devices 14 with which they are engaged. When the locking devices have been actuated as required, assembly 25 is raised to free the die locking devices 14 and the actuator 35 is actuated reversely to return the actuating members 24 to their required initial position.

Figure 8 shows how a pair of stop members 23, of which one only can be seen, are pivoted at 23a to the side plates of roller conveyor 21 on which the die pair 10 is moved. Stop members 23 are coupled by a bridle 37 passing beneath the conveyor 21 and having upstanding arms 37a which are pivoted at 23b to actuator arms 23. At the centre of bridle 37 is attached the piston rod of a pneumatic actuator 38, of which the cylinder is pivotally anchored to a machine frame member at 38a. When actuator 38 is operated to lower stops 23, these assume the position shown in broken line at 23c and thus allow the die pair 10 to be moved onwards on the conveyor 21.

Figure 9 shows an arrangement 40 which may be used for ensuring that a locking device 14 of a die pair 10 is correctly positioned to allow the upper die to be placed upon the lower die, following a period in which the dies have been separated to remove a baked product and to refill the dies with uncooked foodstuff. It is assumed that the lower die 12 has just been moved transversely on to roller conveyor 21, in a direction perpendicular to the plane of the Figure. A pneumatic actuator 41 secured to a member of the machine frame carries on its piston rod a pressure plate 42. When the actuator 41 is operated to extend the piston rod, plate 42 is directed against the adjacent die locking member 14 in a direction perpendicular to the side of the die 12 and aligned with the pin 15 on which locking head 16 rotates. Head 16 is thus aligned for free passage through the slot 17 of the upper die which is to be lowered upon the lower die. It will be apparent that the arrangement described in relation to Figure 9 cannot be used to align both locking devices.

Figure 10 shows another arrangement which can be used to align the head 16 of a locking device 14 on a lower die so that an upper die can be placed upon the lower die. The arrangement shown in Figure 10 comprises a shaft 45 which extends across the conveyor 21 on which a die 12 is being moved and is supported for rocking movement in suitable bearings (not shown) secured to the machine frame. Shaft 45 is provided with an offset, laterally extending arm 46. Shaft 45 is operated by a pneumatic actuator 49 situated to one side of the conveyor to allow free passage of the dies and pivoted upon the machine frame at 50. The piston rod of actuator 49 is coupled to a crank 51 fixed to the end of shaft 45. When actuator

49 is operated the actuator piston rod returns into the cylinder, shaft 45 is turned anti-clockwise through 90°, as shown by the broken line outlines, and arm 46 engages locking head 16 to position this part of to the side of the die 12. Both clamping devices have thus been positioned to permit the upper die to be lowered upon the lower die. When this latter operation has been effected, the die pair advances to a station at which it is situated beneath an actuator assembly which is lowered upon it to engage the locking devices. After the closed die pair has been passed through a heating station and sufficient time has elapsed for the cooking to be completed, the die pair is again positioned below an actuator assembly which is lowered upon it to unlock the clamping devices prior to separation of the dies of the pair.

The expression "producing electric currents in the dies" used in the present specification is, of course used, as in the main application, to include both conductive or inductive production of the heating current in the dies.

#### WHAT WE CLAIM IS:-

1. A method of baking food products which includes subjecting mating metallic dies, together forming a mould determining the form of a baked product, to a cycle of operations which includes the steps of separating the dies and removing a baked food product from the mould, juxtaposing the dies, introducing uncooked foodstuff into the mould and producing electric currents in the dies to heat the dies, and clamping said dies together immediately following juxtaposition and until immediately prior to die separation.

2. Apparatus for baking food products including a plurality of sets of dies, a set of dies forming when juxtaposed a mould of predetermined form including reversibly operable clamping means for clamping said set of dies together, means at one position for releasing said clamping means and for separating juxtaposed dies, means at another position for juxtaposing a set of dies to form a mould and for operating said clamping means to secure said set of dies together, means for introducing uncooked foodstuff into at least one of the dies, means at a further position for producing electric currents in said dies thereby to heat said dies, and means for transporting said dies in closed paths between said positions.

3. Apparatus in accordance with claim 2 wherein each set of dies includes a clamping member mounted on one said die for movement between a first position in which it engages a second die juxtaposed with said first die to clamp said dies together and a second position in which said dies are free to be separated.

4. Apparatus in accordance with claim 3 in which said clamping member includes a portion of non-circular form capable of passing through an aperture in said second die and arranged for rotation about an axis lying parallel to the direction of separation of said dies between a position in which said portion clampingly engages said second die and a position in which said portion passes freely through said aperture. 45
5. Apparatus in accordance with claim 4 wherein said clamping member is a head member of generally rectangular form rotatably mounted on a pin extending from said first die in the direction of separation of said dies so that its surface nearest the first die is spaced therefrom by a distance substantially equal to the thickness of a portion of said second die containing a rectangular aperture through which said head passes. 50
- 10 6. Apparatus in accordance with any one of claims 2-5 and including means at said positions at which said dies are respectively unclamped and clamped for arresting said dies in alignment with means for operating said clamping means. 55
- 15 7. Apparatus in accordance with claim 6 as dependent upon claim 5 wherein said means for releasing or operating said clamping means includes a forked member mounted for rotation with respect to a support member arranged for movement between a first position in which said forked member engages said head member to impart rotation thereto and a position in which said forked member is removed from said head member, said movable support member being provided with means for producing rotation of said head member. 60
- 20 8. Apparatus in accordance with any one 65
- 25 9. Apparatus in accordance with claim 8 as dependent upon claim 7 wherein said positioning means comprises a lever pivotally movable to engage said head member to ensure its alignment for passage through said aperture. 70
- 30 10. Apparatus in accordance with claim 8 as dependent upon claim 7 wherein said positioning means comprises a pressure plate moved by a pneumatic actuator to engage said head member. 75
- 35 11. Apparatus for baking food products including pairs of dies substantially as described with reference to Figures 1 to 4 of the accompanying drawings. 80
- 40 12. Apparatus in accordance with claim 7 substantially as described with reference to Figures 5, 6 and 7 of the accompanying drawings. 85
13. Apparatus in accordance with claim 8 substantially as described with reference to Figure 8 of the accompanying drawings. 90
14. Apparatus in accordance with claim 9 substantially as described with reference to Figure 10 of the accompanying drawings. 95
15. Apparatus in accordance with claim 10 substantially as described with reference to Figure 9 of the accompanying drawings. 100
16. A method of baking foodstuffs in accordance with claim 1 and substantially as described with reference to the accompanying drawings. 105

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Sheet 1

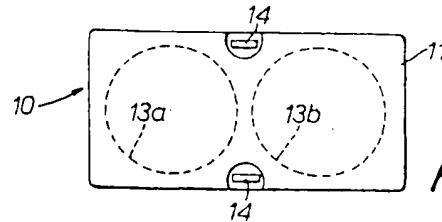


FIG. 1.

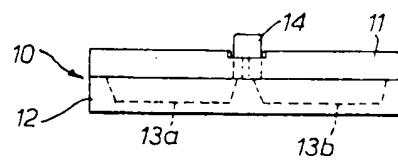


FIG. 2.

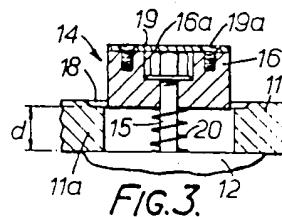


FIG. 3.

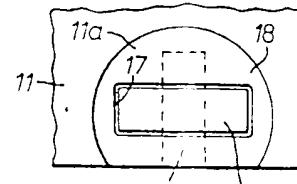


FIG. 4.

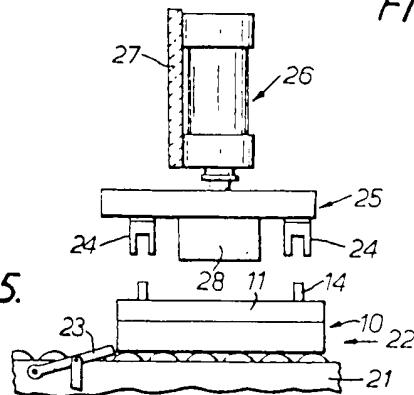


FIG. 5.

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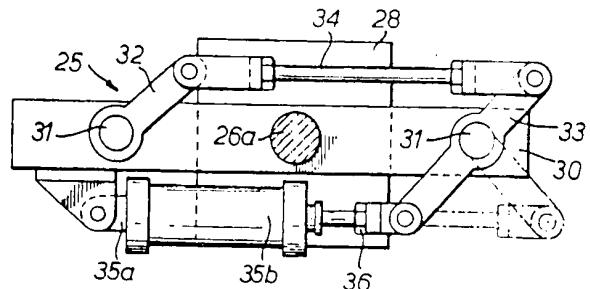


FIG. 6.

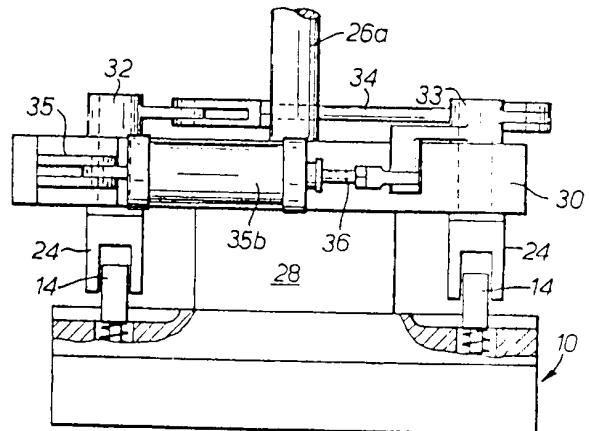


FIG. 7.

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Sheet 3

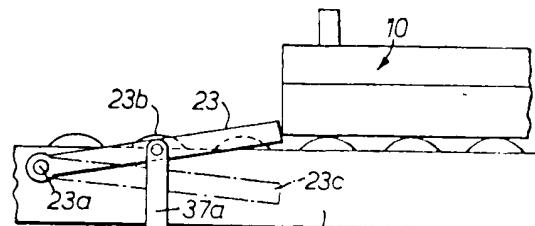


FIG. 8.

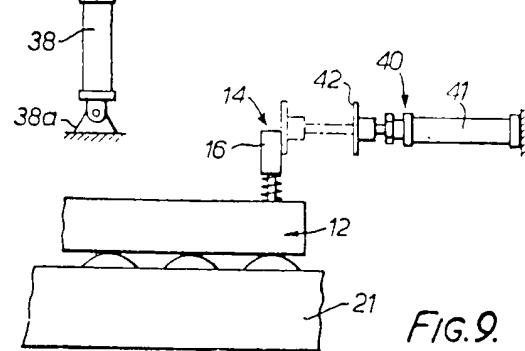


FIG. 9.

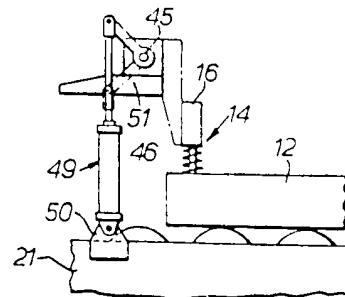


FIG. 10.